Glass Industry

Innovative solutions for your success

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Dear Reader,

Artificially produced glass is one of the oldest materials ever made by humans from natural resources. The story of its manufacturing can be traced back to 2,000 B.C. Prior to that time natural forms of glass, such as obsidian, were used in tools like wedges and blades.

Glass is still an extremely important product in many areas of our day-to-day life today. Its manufacturing falls into two categories: hollow glass and flat glass. We come across both forms on a daily basis in items such as glass bottles or window glass. However, only glass manufacturers know just how much glass production depends on reliable processes and precise measurement technology.

JUMO, your reliable partner with comprehensive expertise, is at your side to help when you have questions and need solutions.

No matter what your requirements for measurement technology, JUMO will always meet them with the ideal solution for specific applications in the glass industry.

So how do we do it? Through our years of experience and a high level of expertise. For more than 60 years JUMO has been one of the leading manufacturers in the field of measurement and control technology and consequently the company is also a professional partner for the glass industry.

We place special importance on the constant development of new products, continuously improving existing ones, and on making production methods more and more economical. This is the only strategy through which we can achieve the highest level of innovation.

JUMO offers only the best products for the glass industry – a wide range of solutions that are perfectly tailored to the extreme temperatures in this area of production. This brochure gives you an overview of the products and systems we have developed especially for this field.

Of course, we would also be happy to work together with you to create customized solutions for individual requirements. The ultimate result of these solutions is consistently high quality!

Contents

Manufacturing of container glass

The container glass industry, which is also known as the hollow glass industry, manufactures all forms of glass packaging for the food, pharmaceutical, and chemical industries.
The first-class systems from JUMO help with these processes.

Manufacturing of container glass

Temperature solutions for container glass manufacturing

The glass industry deals with very high temperatures. The reason here is that the silicon dioxide needed to make the glass has to melt. This occurs at temperatures of about 1,600 °C. The main challenge that the temperature sensors have is to take consistent measurements throughout the glass furnace's entire operating life. As a result, throughout the whole process temperatures have to be regulated with an extremely high level of precision over a long time.

A smelting furnace is made up of a melting vat, which holds the solid materials while they are heated. The dome of the vat is known as the crown. Measuring and controlling the temperature on the roof of the furnace is especially important because precise adherence to the required temperature will prolong the crown's operating life and prevent overheating.

However, temperatures that are too low could have a negative impact on the melting rate and fuel consumption.

To ensure reliable measurement and controlling, suitable materials need to be selected for the temperature probes as they have to withstand high temperatures throughout the furnace's entire operating life. JUMO has extensive experience in the area of temperature sensor manufacturing for the glass industry and uses components such as ceramic immersion sleeves.

Push-in thermocouple
For the feeder
Type 901830

Screw-in thermocouple
For the flue
Type 901830

Push-in thermocouple
For the feeder
Type 901830

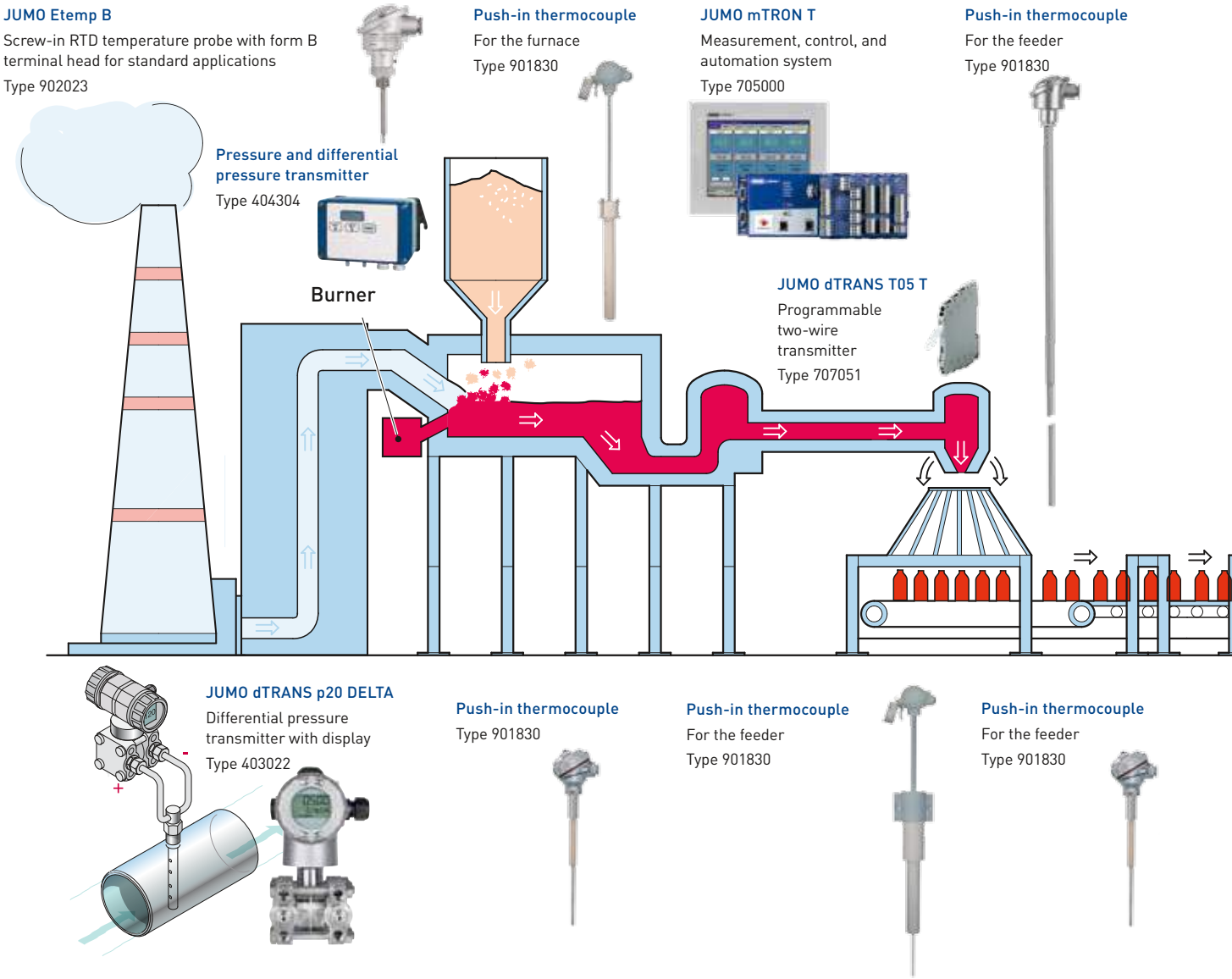
JUMO IMAGO 500
Multichannel process and program controller
Type 703590

JUMO dTRON 304/308/316
Compact controller with program function
Types 703041, 703042, 703043, 703044

JUMO DICON touch
Two-channel process and program controller with paperless recorder and touchscreen
Type 703571

An overview of container glass manufacturing

Hollow glass is manufactured using compression, blowing, and suction procedures as well as a combination of all three techniques.
As a result, the majority of the machines in this field use a blow-and-blow method or a press-and-blow method. Carousel machines using the press-and-blow method are used to produce delicate table wear. Because the material expands in different ways, each piece of glass is subject to a certain level of mechanical tension during manufacturing. A material's susceptibil-



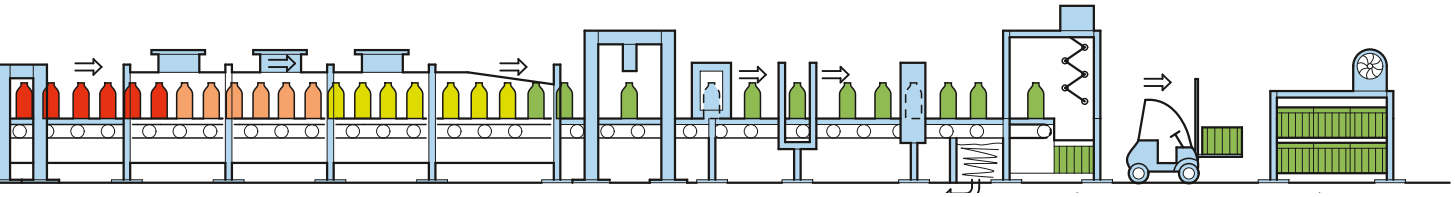
ity to tension depends on the expansion coefficient of the type of glass in question and has to be reduced using temperature equalization. For each glass a cooling range that lies between the upper cooling temperature of 590 °C (viscosity of 1013 dPas) and the lower cooling temperature of 450 °C (1014.5 dPas) can be defined.
These tensions are reduced by "tempering". This process refers to the defined, slow cooling of the glass within the cooling range.

JUMO dTRANS p32
Pressure transmitter
Type 402051

JUMO pressure transmitter
For small measuring ranges
Type 404327

JUMO dTRANS p20
Process pressure transmitter with display
Type 403025

Push-in thermocouple
For the vat
Type 901110



JUMO TYA 201
Single-phase thyristor power controller
Type 709061

Humidity and temperature measuring probe
For industrial applications
Type 907023

JUMO dTRANS p30
Pressure transmitter
Type 404366

JUMO DELOS T
Electronic temperature switch with display and analog output
Type 902940

Manufacturing of flat glass

The flat glass industry produces glass for fields such as construction, vehicle manufacturing, and furniture.
The first-class systems from JUMO support you with the manufacturing of these glasses.

Control solutions for the flat glass industry

In addition to measuring temperature, temperature control also plays a major role in the glass industry. Other than premium temperature probes developed especially for this field JUMO has also created various custom-made controllers and automated solutions for the industry. The one-channel controllers in the JUMO dTRON range, the JUMO mTRON T multichannel controllers, JUMO DICON touch, and JUMO IMAGO 500 series can be used in various glass manufacturing processes and control a wide range of process variables.

JUMO IMAGO 500
Multichannel process and program controller
Type 703590

JUMO dTRON 304/308/316
Compact controller with program function
Types 703041, 703042, 703043, 703044

JUMO DICON touch
Two-channel process and program controller with paperless recorder and touchscreen
Type 703571

Push-in thermocouple
For the vat
Type 901110

Push-in thermocouple
For the furnace
Type 901830

JUMO Etemp B
Screw-in RTD temperature probe with form B terminal head for standard applications
Type 902023

An overview of flat glass manufacturing

Machine-drawn, rolled-plate, or cast flat glass is normally produced using a float glass method in which the melted glass floats on a layer of tin which has also been melted. This ensures a high level of product quality.

The rolling and drawing methods are usually used to manufacture flat glass with unique properties or a certain surface structure. The float glass process was developed by the glass manufacturer and processor Pilkington in 1959. It saw the start of a mini industrial revolution as today practically all glass used in the construction industry is manufac-

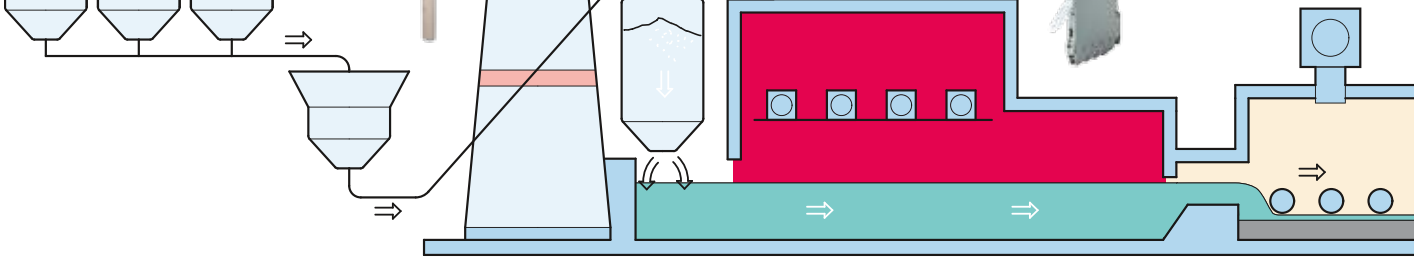
JUMO Etemp B
Screw-in RTD temperature probe with form B terminal head for standard applications
Type 902023

Push-in thermocouple
For the furnace
Type 901830

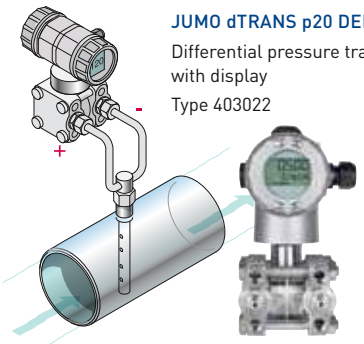
JUMO mTRON T
Measurement, control, and automation system
Type 705000

Push-in thermocouple
For the feeder
Type 901830

JUMO dTRANS T05 T
Programmable two-wire transmitter
Type 707051



JUMO dTRANS p20 DELTA
Differential pressure transmitter with display
Type 403022



Push-in thermocouple
For the feeder
Type 901830

Push-in thermocouple
For the feeder
Type 901830

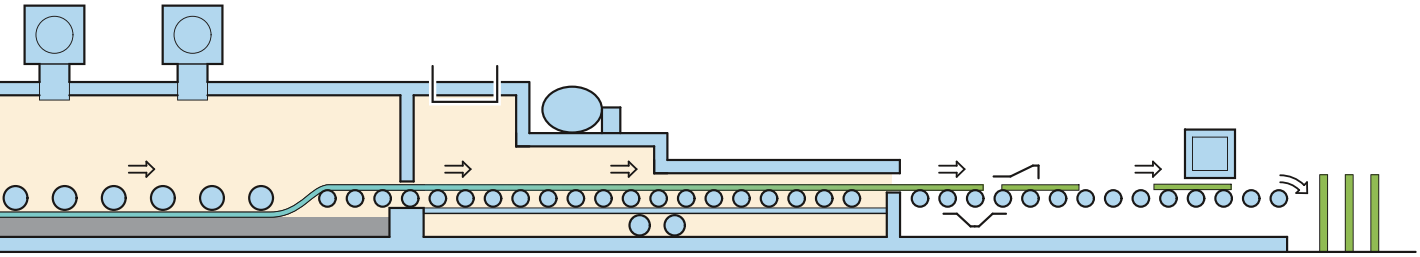
tured with this method. The name "float glass" refers to the glass being melted on a reservoir in a furnace during the manufacturing process. Afterwards, the produced mass is then routed into a chamber which holds a bath made out of molten tin. The molten glass floats on the tin, spreads out, and moves horizontally towards the chamber's outlet. It then passes through a cooling tunnel before being cut. This method can be used to manufacture high-quality glass.

JUMO dTRANS p32
Pressure transmitter
Type 402051

JUMO pressure transmitter
For small measuring ranges
Type 404327

JUMO dTRANS p20
Process pressure transmitter with display
Type 403025

Push-in thermocouple
For the vat
Type 901110



JUMO TYA 201
Single-phase thyristor power controller
Type 709061

Humidity and temperature measuring probe
For industrial applications
Type 907023

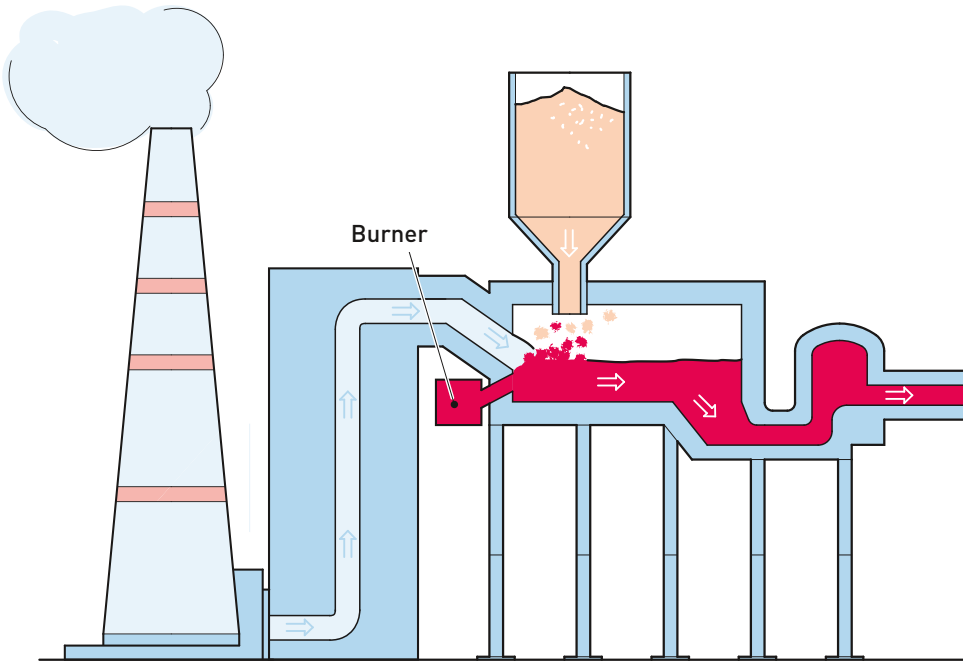
JUMO dTRANS p30
Pressure transmitter
Type 404366

JUMO DELOS T
Electronic temperature switch with display and analog output
Type 902940

The challenges of glass melting

During the first phase of glass production the different raw materials – a combination of sand, shards, lime, and sodium carbonate – are melted in special furnaces at temperatures up to 1600 °C. These plants usually consist of tiles that are designed to withstand the most extreme process conditions. The temperature difference in the chimney is fundamentally important for monitoring the efficiency of the burner. The process temperature and the change in the flow direction are monitored closely in the burner to improve the conditions in the following step.

One of the distinctive characteristics of the glass is formed precisely in this process so that the glass is very versatile for use in different applications and can withstand many conditions like heat or cold.



Push-in thermocouple
For the feeder
Type 901830

JUMO dTRANS p30
Pressure transmitter
Type 404366

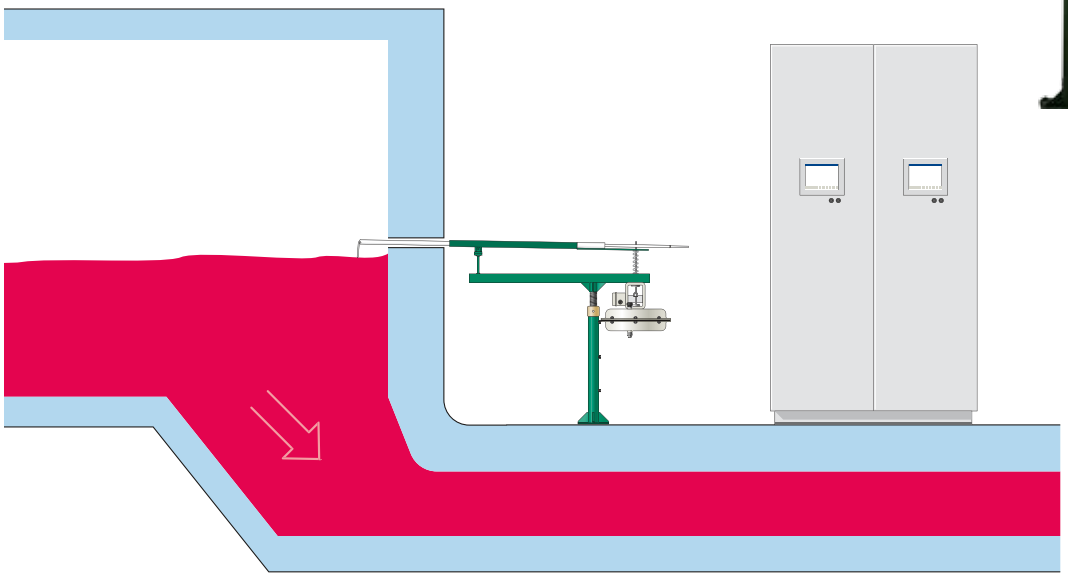
JUMO DELOS SI
Precision pressure transmitter with switching contacts and display
Type 405052

JUMO PINOS L01
Calorimetric flow sensor
Type 406040

Level measurement in liquid glass

The measurement of the glass level is highly critical due to the high temperatures. A level sensor that has been especially designed for the glass industry can determine the filling height of the liquid glass.
The sensor taps on the glass surface which allows it to determine the immersion depth up to that point. That is how the height of the glass melt – the glass level – is calculated. The measurement and calculation as well as the configuration of the level sensor are done through the JUMO mTRON T measurement, control, and automation system. Upon request, it can be equipped with a touchscreen for on-site display and documentation purposes.

Glass level sensor
Level sensor



JUMO mTRON T – Your System

The scalable measuring, control, and automation system

The JUMO mTRON T automation system is used for the control, management, and measurement of the glass level sensor. In addition, the automation system offers further universal possibilities that make the control and management of the furnace possible.

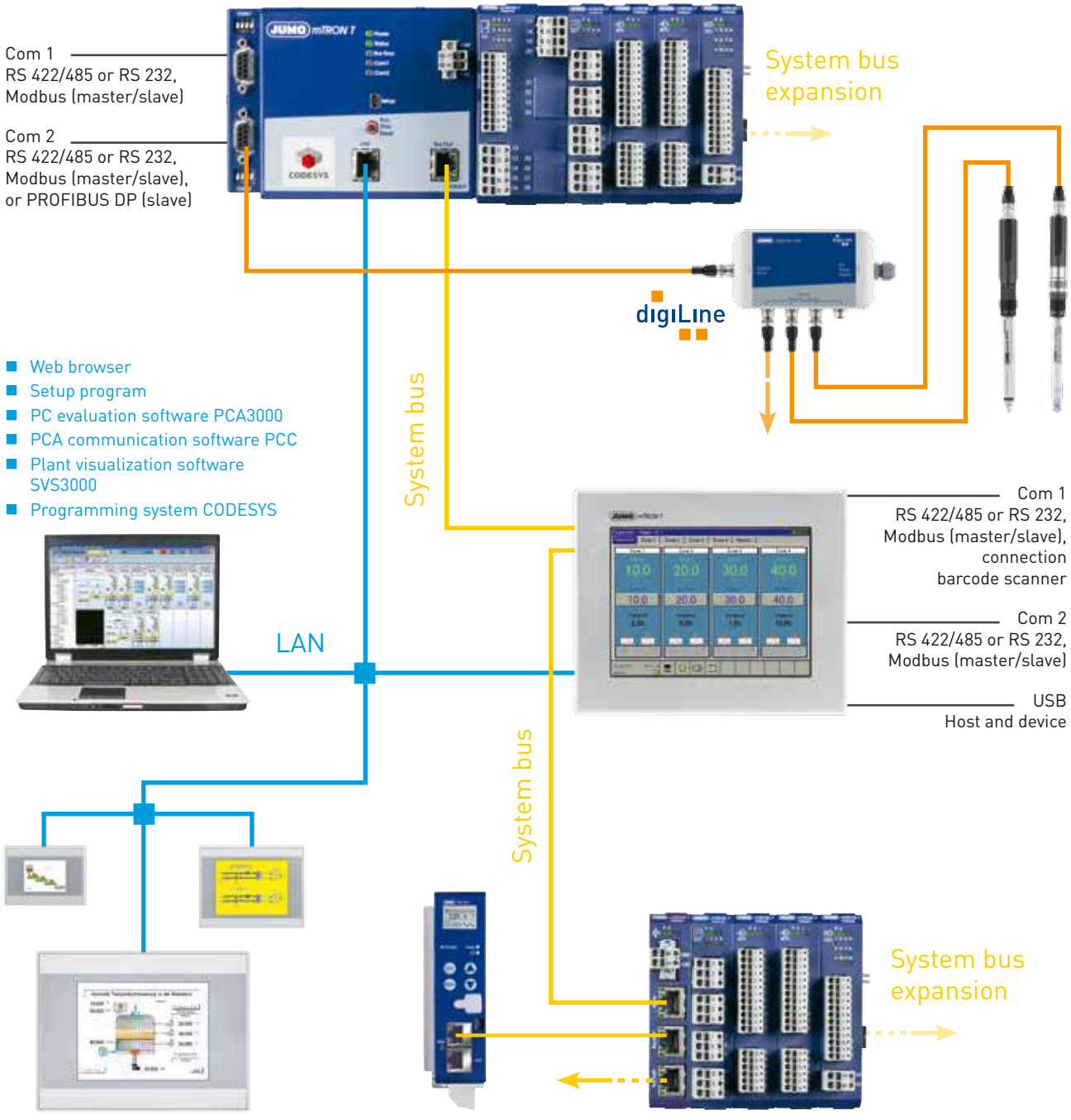
The heart of the JUMO mTRON T is a central processing unit with a process map for up to 30 input/output modules. The CPU has superordinated communication interfaces including web server functionality. For individual control applications, the system has a PLC (CODESYS V3), program generator, and limit value monitoring functions as well as math and logic modules.

Various components are available as input/output modules (e.g. analog input modules with galvanically isolated universal analog inputs for thermocouples, RTD temperature probes, and standard signals). As a result the same hardware can be used to precisely record and digitize a highly diverse range of process variables. Every multichannel controller module supports up to four PID control loops with a fast cycle time and proven control algorithms. The control loops here operate fully independently which means that they do not require resources from the central processing unit. Overall the system allows for simultaneous operation of up to 120 control loops so that it can also be used for sophisticated processes. Through expansion slots the inputs and outputs of each controller module can be individually expanded and adapted. Power controllers can also be connected directly via the system bus.

A multifunction panel visualizes the measured values and enables convenient operation of the overall system. User-dependent access to parameter data and configuration data can also be set up. The use of standard predefined screen masks considerably reduces startup times. The recording functions of a fully-fledged paperless recorder, including additional web server functionality, are also implemented in the multifunction panel. The data recording function is tamper-proof and also provides comprehensive batch reporting. Proven PC programs are available for extracting and evaluating historical data. If required, the JUMO mTRON T can be made even more flexible with additional operating panels.

A setup program is used for **hardware and software configuration** as well as for project planning of the measured value recording and control tasks. Users can also develop their own highly efficient automation solutions with CODESYS editors according to IEC 61131-3. And last but not least, JUMO digiLine sensors for liquid analysis can also be connected directly to the JUMO mTRON T via PLC application.

System structure



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PR 00088 EN/00665140/2018-07-20/V2